IOT BASED GAS LEAKAGE SYSTEM USING ARDUINO

A

PROJECT REPORT

ON

IOT BASED GAS LEAKAGE SYSTEM USING ARDUINO

SUBMITTED BY

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(DEPARTMENT OF MSC.IT)

ACKNOWLEGEMENT

DECLARATION

We hereby declare that the project entitled, **"IoT Based Gas Leakage System Using Arduino"**, has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted toany other university.

The project is done in partial fulfilment of the requirements for the award of degree of **Master of Science (Information Technology)** to be submitted as final semesterproject as part of our curriculum.

**ASHISH SINGH &
SUMAN THAKUR**

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EXECUTIVE SUMMARY

The Internet of Things (IoT) aims to automate the lives of the world by giving the path with or without human interference which will automate the tasks which may be bigger or smaller than we encounter. Because the Internet of Things (IoT) intends to simplify working, it is also practical to use well-being to reinforce present security standards. The essential goal of every project has not gone ignored by IoT. In open or closed situations, gas leakage may be savage. While traditional gas detection systems are noiseless and accurate, they are unaware of a few key aspects in the area of warning people of a leak. As a result, we have built the implementation for both industry and the society which will detect the leakage of gas and also monitor the gas availability. Alerting techniques that include sending messages to the applicable command as well as the ability to analyze sensor reading data. These days, gas leakage and detection are major concerns in our daily lives. LPG gas is very burnable, posing a risk to both people and property. To avoid such accidents, a notable amount of try has gone into developing reliable systems for detecting gas leaks. Our significant objective is to recommend a gas detection that includes gas leakage detecting hardware to households in the area. This can monitor dangerous chemicals in the air at workplaces and it may also be used in households by alerting through an LCD and sending a message to a recorded phone number.

Introduction

LPG is the abbreviation, It's a non-renewable supply of energy. It is taken out from rock oil and gas. LPG is very burnable and should thus behold on-off from sources of a solenoid and during a blowy space so that any run will safely. LPG vapors are more steam than air thus care to be taken all over storage so that any run won't sink to the bottom and find accumulated in a district that is low untruthful and tough to disperse. LPG gas is an alkane and it's scentless in its state of nature. The stink that we tend to observe once there's a run is really of a wholly different agent. This material is added to the gas at one time it leaves the most storage terminals. The paper aims to detect Gas leakage in houses, restaurants, schools, and other places, and gives messages to the nearby people. These days Gas sensors are being used nationally in the field like safety, health, appliances, etc. This paper is an implementation using an MQ-5 sensor. The MQ5 sensor is used for detecting gas leakage for different implementations. The device also keeps displaying the leakage in the LCD. The MQ6 sensor searches the concentration of gas and outputs an analog value that can be converted to a digital signal using an inbuilt A to D Convertor. The paper permits the user to set the low, medium, and dangerous levels for leakage based on the same digital measure. The strength values are differentiated with two thresholds and based on that, it classifies into three different classes. Liquified petroleum gas (LPG) is used in every sector. It is also used for industries-based purposes. The main advantages of LPG Gas leakage many accidents happen and their result shows both material, product loss, and human injuries. The principal motivation behind our frame is to differentiate the gas in houses and other homegrown with the help of a gas sensor. After identifying the message will be conveyed to the person.

Defining IOT

The term IoT, or Internet of Things, refers to the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves. Thanks to the advent of inexpensive computer chips and high bandwidth telecommunication, we now have billions of devices connected to the internet. This means everyday devices like toothbrushes, vacuums, cars, and machines can use sensors to collect data and respond intelligently to users. The Internet of Things integrates everyday "things" with the internet. Computer Engineers have been adding sensors and processors to everyday objects since the 90s. However, progress was initially slow because the chips were big and bulky. Low power computer chips called RFID tags were first used to track expensive equipment. As computing devices shrank in size, these chips also became smaller, faster, and smarter over time. The cost of integrating computing power into small objects has now dropped considerably. For example, you can add connectivity with Alexa voice services capabilities to MCUs with less than 1MB embedded RAM, such as for light switches. A whole industry has sprung up with a focus on filling our homes, businesses, and offices with IoT devices. These smart objects can automatically transmit data to and from the Internet. All these "invisible computing devices" and the technology associated with them are collectively referred to as the Internet of Things.

LITERATURE REVIEW

This device is used as the detect gas is already present the market which is generally used in many places like industries there are many chances of the detonation which may lead to great destruction and the loss of manpower; in homes, where the LPG gas used most generally in our daily inevitably where it can detect the leakage of LPG gas; in cars, where most of the vehicles carry the cylinder and many more places. Dr. Walter Snelling was the first to launch LPG gas in 1910. It's a combination of propane and commercial propane. It is very volcanic and many accidents occur as a result of LPG leaks. As a result, it is necessary to relate and prevent gas leakage. Gas Detectors can be assorted in a variety of ways. They're split into groups based on the type of gas they detect, the automation that power the sensor's output, and the components that affect the sensor's power (semiconductors, oxidation, catalytic, photoionization, infrared, etc.). In our everyday lives, we utilize a confirm of gadgets for various purposes, and the seniority of them can discharge any type of gas or chemical when in operation in the air. In any scheme, it is difficult for a human to keep an eye on the levels of the application of the leaked gas or to detect whether there is a leakage of gas or not. If there is some leakage in gas when there is no one around, it may originate detonation when there is even a spark or the surrounding will have the dangerous gas which may lead to smothering and will lead to having fitness issues in breathing. There are many applications for observation and monitoring of the leakage of gas, but still, the researchers will construct the attempt in making the advanced application where the value of the application will be lesser.

OBJECTIVE

Safety plays a critical role in today's world and it is vital that certain solutions are implemented in places of work and living. Whether it is electricity or oil and gas, working or living in hazardous conditions demand certain safety protocols.

Liquified Petroleum Gas (LPG) is a type of natural gas liquified under extreme pressure and contained in a metal cylinder. LPG is extremely sensitive to fire and causes a great disaster if exposed to any fire source without precaution.

LPG is more widely available than any other natural gas and is primarily used for cooking. Unfortunately, its broad use makes the event of gas leakage or even a blast standard. Therefore, there is a need to develop a gas leakage detection and monitoring system. The solution could detect gas leakage, send an alert to the end-user via an SMS or a buzzer, and feature an exhaust fan that gets activated once the gas or fire is detected. The fan aims to push the air outside.

In another scenario, we could use a load cell sensor to monitor the weight of the LPG gas cylinder regularly and feed the values to the microcontroller. Suppose the gas in the cylinder indicates a value where the remaining percentage level falls below the threshold level set for gas. In that case, the gas cylinder company should be notified immediately to refill the cylinder or replace it. The sensor is also handy for monitoring gas usage over a period.

NEED

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The use of such gasses cannot be denied. However, they have also brought about a greater risk and threat to human life. With safety a primary concern, businesses dealing with gas have to take certain precautions to ensure work is carried out in the most secure manner possible. That is where a gas detection system is necessary at accident-prone locations, including households, to continuously monitor any kind of leakage - regardless of the human senses - and send an alert to the end-user.

The gasses are toxic in nature, resulting in human unconsciousness and even death if consumed in larger quantities. Moreover, gaseous blasts are another disaster that everyone - working in a factory or at home - would want to avoid at all costs Using an Ethernet shield module and Android application, the IoT device informs the end-user about the environmental conditions, such as the temperature of the location and gas level. The gas detection system monitors the surroundings continuously and prevents further gas leakage. The IoT-powered gas leakage detection utilizes an MQ6 sensor for the same. It detects the malfunctioning of the pressurized gas system to prevent the accumulation of gasses so that the explosion does not happen. The system is divided into three modules: Firstly, the MQ6 gas sensors detect gas leakage. Secondly, the signals are sent to the ARM through the IoT sensors. Post this, an activation ping gets sent to the devices connected externally with the help of a microcontroller. Lastly, various functions by devices such as exhaust fan, buzzer, and sprinkler are performed, further activating the GSM module. The GSM module and the ARM-based microcontroller use gas detection for communicating amongst devices. In addition, Arduino, a low-cost microcontroller, is engineered in such a way it receives the input data from the sensors. For ensuring regular communication between Arduino and the smartphone, Bluetooth is required.

SCOPE

The said system can be deployed in homes, hotels, factory units, LPG cylinder storage areas, and so on. The main advantage of this IoT and Arduino-based application is that it can determine the leakage and send the data over to a site. It can be monitored, and preventive measures can be taken to avoid any disaster. Suppose corrective steps are taken promptly after it is reported over the IoT devices. In that case, that can help save the loss of lives, alleviate any mishaps from happening, and cut down on business expenses. The gas leakage detection system can be optimized for detecting toxic gasses along with upgrading them with smoke and fire detectors to identify the presence of smoke and fire. Ensuring worker safety is important but making using of the right technology is even more vital. A human nose comprises 400 different types of scent receptors that enable us to smell approximately 1 trillion various odors. However, most of us cannot identify between the different gasses present in the atmosphere. That is where gas detection sensors come in handy. They are most commonly used to develop an IoT-powered system and identify the variation of toxic gasses in an industrial facility. It helps benefit the refineries and factories by safeguarding them from unexpected threats such as gas leakage and explosions. Here are the top benefits of IoT-based apps used in gas leakage detection

METHODOLOGY

The sensors are powered by microcontrollers or relays and LCDs and a buzzer. This voltage rule sector is accountable for converting alternate power to direct current as well as lowering the transmitted signal. The sensors can detect a gas leak. The sensor MQ-2 is working here to detect LPG levels in the air. The gasses on the scale between 200 and 10000 ppm maybe identify as well as the reaction time is completely speedy. The result of the sensors would be an analog power. A sequential communication circuit makes over the change from an analog resistor to voltage. The microcontroller report that voltage. This analog voltage is digitally converted using a 12-bit Analog to a digital converter. In the advanced system of a gas detection system, the implementation quells both the monitoring and detection of the gases which are very dangerous to the surrounding. In the observation of the gas, the sensor which is used to hear many gases is MQ 2 sensor. After the detection of leakage in the gas, the sensor sends the signal to the Arduino UNO for further operation where other hardware components are connected. Through Arduino UNO, it sends the signal to the LCD for displaying the alert message as LPG Detected, suitably, the buzzer be on so that the backdrop people will the warn, as well as the main power supply, will be cut off. Using the relay of 5V, the power supply is given to the expend fan to detach the harmful gas from the surrounding. Even the container of the application will accept the message through the GSM module.
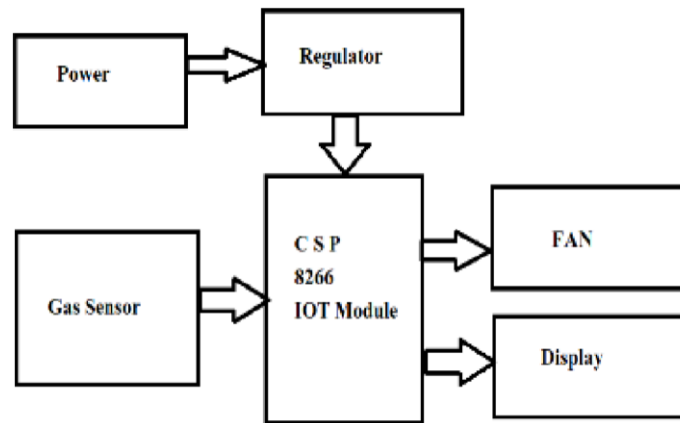
Fig. 31: IOT based gas leakage system

Fig 32: Hardware Module

1) Components used:

    a) Arduino

    b) MCU Module

    c) LPG Gas sensor module

    d) Buzzer

    e) 16*2 LCD display

    f) 1K resistor

    g) Cooling fan

    h) Connecting wires

    i) Relay

a) Arduino Pro Mini:

The **Arduino Pro Mini** is a microcontroller board based on the ATmega328P.It has 14 digital input/output pins, 6 inputs, and an onboard resonator. A restart button and holes are used for mounting pin headers. A 6-pin header can be connected to an FTDI cable or communication to the board. The Arduino Pro Mini is calculated for semi-permanent installation in objects. The panel comes without pre-mounted headers, allowing the use of various types of the loop or direct soldering of wires. The pin layout is agreeable with the Arduino Mini. There is two types of Pro Mini runs at 3.3V and 8 MHz, the other at 5V and 16 MHZ.

Fig. a) Arduino Pro Mini

b) MCU Module:

An MCU is an intelligent semiconductor IC that consists of a processer unit memory module, communication interfaces, and peripherals. The Microcontroller Unit is used across a wide-ranging of applications, including washing machines, robots, drones, radio, and game controllers.

Fig. b) MCU Module

c) LPG Gas sensor module:

The sensing element is accomplished by detecting 6 differing kinds of combustible gases on label sensitivity.

This sensing element may be labeled mistreatment in the potentiometer fitted within the jailbreak board of the MQ6 gas sensing element. The sensing element dispenses associate degree analog output. The MQ-6(LPG Gas Sensor) will observe gas concentrations in any place from 200 to 10000ppm. The sensor output is associate degree analog resistance. Combining with the sensing element module is stopped through a 4-pin board compatible header.

**Fig. c)** LPG Gas Sensor Module

d) Buzzer:

A buzzer or pager is an audio signaling device, which can be mechanical, mechanical device. The buzzer has 2 pins in it. It is easy construction and low worth creating it is usable in varied applications like car/truck reversing indicators, computers, and decision bells. It is that the phenomena of generating electricity once mechanical pressure is applied to sure materials and also the other way around are additionally true.

Fig. d) Buzzer

e) 16*2 LCD display:

It is Liquid Crystal Display (LCD) It uses liquid to supply a noticeable representation and every character is manufactured from 16x2 image element dots. Handling Voltage is 4.7V to 5.3V. Current utilization is 1mA without a backlight...

Figure: 4.4 16×2 LCD Display
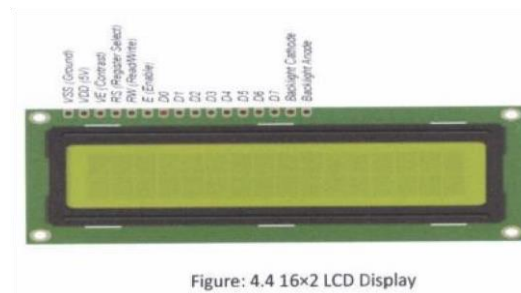
Fig. e) 16*2 LCD Display

f) Cooling Fan:

If the disproportionate gas released already makes it more likely of missing in order to compensate for it, an exhaust fan is used for evacuation. Cripple fans are usually able to extract hot or damp air from the small, limited zone to let clean air from another place (maybe a door or ventilation) in order to replace it. The heated air extracted by an electric fan is promoted via a heat exchanger and driven out outside.


Fig. g) Cooling Fan

g) Relay:

Relay having 220V as well as a 5V input, when needed, is applied in the circuit to turn off the electricity. There are 5 pins in the relay. The digital pins encompass its Arduino board are linked with one pin. One is linked to the switch to attach the 220V power source. This power has deviated to the devices between the other pin. The other 2 are beach one in the main energy source and another one for the Arduino board.

Fig. g) Relay
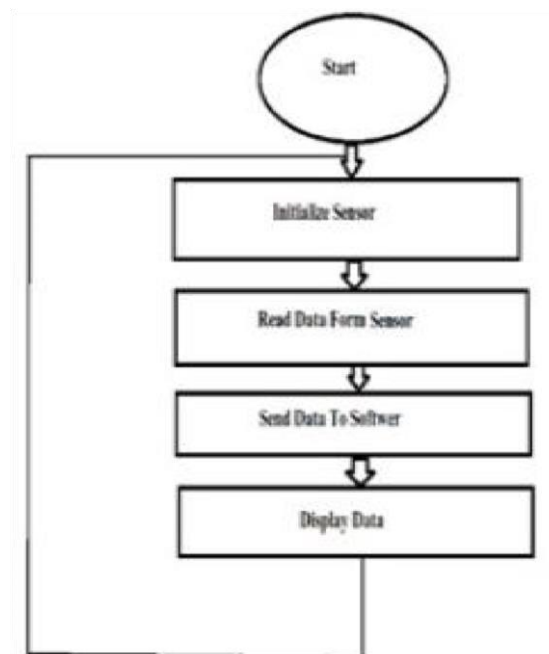
Fig: Flowchart of System

LIMITATIONS

1. Only one gas can be measured with each instrument.

2. When heavy dust, steam or fog blocks the laser beam, the system will not be able to take measurements. This is also the case when a person or vehicle blocks the path.

3. It can be poisoned by lead, chlorine and silicon.

4. It gets reacted due to heating of wire.

5. It requires air or oxygen to work.

CONCLUSION

This system provides a fast and cost-effective solution to avert the gas leak effect by reducing the risk to human life. The statistics of the application of gas clam on to the application can be useful to own the faulty valves and regulators prior and do the necessary replacement. Apart from detecting the leakage, a two-level prevention apparatus makes the system more valid. The cost involved in developing the system is crucially low. In recent brood, the use of LPG is taking a big giant. From the use of cylinders up to the use of petroleum lines. The biggest warning in using this technology is security our project will prove to be resonance for households and industries.

FUTURE SCOPE

This monitoring system can be further increased by using Bluetooth in place of GSM to send the alert messages to the user, which abetment another real-time application. For the industrial sector, the data collected by the mobile application is beneficiary and used for data analytics. The combination of other sensors like temperature, pressure sensors, etc. makes the system a home computerization project. IoT turns drones into gas observation sensors. Another very interesting and extraordinary improvement would be to board reoccurring receiver MODEMS at different positions in the geographical area carrying duplicate SIM cards. The display can be another added variant in the project. Audio output can be settled to make it user-friendly.

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